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U.S. ATOMIC ENERGY COMMISSION
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Mr. L. Manning Muntzing
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Muntzing:

The Environmental Protection Agency has reviewed the draft environmental statement for the San Onofre Nuclear Generating Station, Units 2 and 3 and our detailed comments are enclosed.

Our principal radiological concerns are the lack of an iodine removal system for the condenser air ejector off-gas, and the potential doses to the general public using the beach area adjacent to the site arising from abnormal events at the station.

From a water quality viewpoint, we anticipate that the station may not be able to, in all instances, comply with the Federally approved state thermal standards.

We will be pleased to discuss our comments with you or members of your staff.

Sincerely,

Rebecca W. Hanmer
for Sheldon Meyers
Director
Office of Federal Activities

Enclosure

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Washington, D.C. 20450

JANUARY 1973

ENVIRONMENTAL IMPACT STATEMENT COMMENTS

San Onofre Nuclear Generating Station, Units 2 and 3

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INTRODUCTION AND CONCLUSIONS

The Environmental Protection Agency (EPA) has reviewed the draft environmental statement for the San Onofre Nuclear Generating Station, Units 2 and 3, prepared by the U.S. Atomic Energy Commission (AEC) and issued on November 21, 1972. Following are our major conclusions:

1. The radioactive waste treatment systems appear to be capable of limiting environmental discharges of radioactive material to the "as low as practicable" levels of 10 CFR Part 50.36a.

2. It is suggested that the final statement discuss alternatives for treatment of the condenser off-gases in the event of leakage of contaminated primary coolant water into the secondary system.

3. The accessibility of the adjacent beach areas to potentially significant numbers of people warrants a discussion of the radiological impact of abnormal events, such as atmospheric steam dumps (including those associated with loss-of-load conditions) which could lead to puff-type releases of radioactivity. If such events are infrequent, substantiation of this fact should be presented.

4. We anticipate that the proposed system may not, in all instances be able to comply with the federally approved thermal standards for the State of California. This conclusion is based on the discussion in the draft statement which indicated that temperatures at the lower depth diffuser discharge ports could exceed the maximum rise of temperature (20°F) over ambient specified in the standards.

5. The applicants proposed a heat treatment system for the anti-fouling of condensers, which will require a 4 hour discharge at 125°F eight times a year. It is anticipated that this will result in a violation of applicable thermal standards. We believe the applicants should explore alternatives that would eliminate the necessity for discharges at this high temperature.

RADIOLOGICAL ASPECTS

Radioactive Waste Management

The radioactive waste management systems for the San Onofre Nuclear Generating Station, Units 2 and 3, if properly utilized, appear to be capable of limiting the environmental releases of radioactivity to levels that are "as low as practicable."

Detailed comments regarding the proposed waste treatment systems should not influence our major conclusion regarding the anticipated minimal radiological impact of the San Onofre Generating Station; therefore, such comments appear in the "ADDITIONAL COMMENTS" section of this review.

Dose Assessment

The boundary of the exclusion area is located entirely within the Camp Pendleton Naval Reservation. The public has access to the beach areas adjacent to the site and appears to utilize the abandoned U.S. Highway 101 as a parking and camping area. The statement indicates that a recently opened 3-1/2 mile section of beach southeast of the station averaged a daily attendance of 3800 people (estimates of peak attendance were not presented).

The draft statement, in Table 5.9 and in the discussion of inhalation pathways, presents a summary of potential radiation doses to adult individuals at locations of interest for specific periods of exposure; however, all the locations assessed appear to be outside of the exclusion area. The statement indicates that there will be public access to beach areas within the exclusion area shown in Figure 14.5.1-1 of the Preliminary

Safety Analysis Report. The potential population exposures which could result following atmospheric steam dumps (including those associated with loss-of-load incidents) during conditions of failed fuel and steam generator tube leakage, should be assessed. The statement acknowledges the anticipation of failed fuel and steam generator tube leakage, but indicates a loss-of-load under these conditions is not anticipated during normal operation of the units. The frequency of steam dumps, including those during loss-of-load should be indicated in the final statement and, if the results dictate, an analysis of the individual and cumulative doses to an anticipated beach population, should be presented.

Transportation and Reactor Accidents

In its review of nuclear power plants, EPA has identified a need for additional information on two types of accidents which could result in radiation exposure to the public: (1) those involving transportation of spent fuel and radioactive wastes and (2) in-plant accidents. Since these accidents are common to all nuclear power plants, the environmental risk for each type of accident is amenable to a general analysis. Although the AEC has done considerable work for a number of years on the safety aspects of such accidents, we believe that a thorough analysis of the probabilities of occurrence and the expected consequences of such accidents would result in a better understanding of the environmental risks than a less-detailed examination of the questions on a case-by-case basis. For this reason we have reached an understanding with the AEC that they will conduct such analyses with EPA participation concurrent with review of impact statements for individual facilities and will make the results available in the near future. We are taking this approach primarily because we believe that any changes in equipment or operating procedures for individual plants required as a result of the investigations could be included without appreciable change in the overall plant design. If major redesign of the plants to include engineering changes were expected or if an immediate public or environmental risk were being taken while these two issues were being resolved, we would, of course, make our concerns known.

The statement concludes "... that the environmental risks due to postulated radiological accidents are exceedingly small." This conclusion is based on the standard accident assumptions and guidance issued by the AEC for light-water-cooled reactors as a proposed amendment to Appendix D of 10 CFR Part 50 on December 1, 1971. EPA commented on this proposed amendment in a letter to the Commission on January 13, 1972. These comments essentially raised the necessity for a detailed discussion of the technical bases of the assumptions involved in determining the various classes of accidents and expected consequences. We believe that the general analysis mentioned above will be adequate to resolve these points and that the AEC will apply the results to all licensed facilities.

Environmental Monitoring

The following technical comments are offered regarding the environmental radiation monitoring program proposed for this station: (1) the location of air samplers should consider the calculated point of maximum concentration; (2) air sampling for iodine should be considered; (3) the use of thermoluminescent dosimeters (TLD's) should allow the measurement of doses less than 10 mrem/quarter; (4) a TLD station should be placed in the beach area; (5) the analytical procedures for alpha and beta detection in drinking water should be able to detect the concentration levels proposed in the Drinking Water Standards of 1973; and (6) the minimum detectable limit for gamma radiation levels for mud and beach sand are not low enough to detect minor buildups of radioactivity.

NON-RADIOLOGICAL ASPECTS

Thermal Effects

The proposed San Onofre Nuclear Generating Station, Units 2 and 3, are on a site adjacent to San Onofre Unit 1, which began operation in 1968. All three units will be cooled by a once-through flow of water pumped from, and discharged to, the Pacific Ocean. Unit 1 employs a single port discharge while Units 2 and 3 will utilize multi-port diffuser systems. The cooling water demand for Unit 1 is 350,000 gpm and Units 2 and 3 will each require 830,000 gpm. The temperature rise across the Unit 1 condenser is approximately 19°F, while the rise across the Unit 2 and 3 condensers is expected to be 20°F.

On the basis of the information presented in the draft statement, it appears that the thermal discharge from the station, as proposed, may not always conform with federally approved water quality standards for the State of California. As indicated in the draft statement, California water quality standards for new discharges require that:

(1) Elevated temperature wastes shall be discharged to the open ocean away from the shoreline to achieve dispersion through the vertical water column;

(2) Elevated temperature wastes shall be discharged a sufficient distance from areas of special biological significance to assure the maintenance of natural temperature in these areas;

(3) The maximum temperature of thermal waste discharges shall not exceed the natural temperature of receiving waters by more than 20°F;

an exception to the state standards. The California State Resources Control Board has requested EPA's views on this system. EPA, in its communication of 9 November 1972, stated that the applicants should, among other things: (1) determine, under actual or simulated operating conditions, the lethal temperature-time of exposure relationship for the fouling organisms in the intake system; (2) show the necessity for raising the temperature for thermal shock as opposed to maintaining an elevated temperature for a longer period of time; (3) determine the necessity for heat treatment during winter months. We recommend that the concerns expressed in this communication be dealt with in the final statement.

The draft statement was written before completion of the applicants' analyses of the near and far field plume modeling effort. The mathematical analysis of the near field, i.e., immediately above the jets and within 10 diameters of the surface, has been made using a finite difference numerical solution of the full governing equations. The analysis is restricted to no-current situations and assumes no effects of thermal interference with the plumes of the neighboring jets.

The AEC staff indicates that the applicants' far field analysis is inadequate and they recommend further work. In line with this recommendation, we feel that the analysis should also consider the possible interaction between jets when there is ocean water movement toward the shore. Such adverse current situations may occur due to tidal and/or wind action and might cause heated water from one jet to be superimposed on downstream plumes. Since this type of current situation is known to exist, and since

(4) The discharge of elevated temperature wastes shall not result in increases in the natural water temperature exceeding 4°F at (a) the shoreline, (b) the surface of any ocean substrate, or (c) the ocean surface beyond 1,000 feet from the discharge system; and the surface temperature limitation shall be maintained at least 50 percent of the duration of any complete tidal cycle.

The AEC staff made diffuser performance projections using a mathematical model developed by Hirst (Figure 3-27), which assumed a discharge temperature of 78°F. At a depth of 40 feet, this discharge will be 24°F in excess of ambient seawater temperature (54°F); at 30 feet, the 78°F discharge will be 22°F above ambient temperature (56°F). Further, Figure 3-12 indicates that the Unit 2 discharge will be released at depths greater than 30 feet the entire length of the diffuser. It is also noted that the temperature effect study was performed during the month of May. It appears that more representative data could have been obtained if additional studies had been carried out at other times in the year; particularly July or August, when the ambient water temperatures appear to be significantly higher.

A "heat treatment" system is proposed for antifouling of the intake and discharge conduits. Under this plan, every 5 or 6 weeks a portion of the condenser cooling water will be heated by recirculation to a temperature of 125°F and discharged in normal fashion through the discharge conduit for 2 hours. This will be immediately followed by a 2 hour reverse flow of 125°F water through the intake structure. This proposed operation would result in the violation of California's thermal standards. The applicants have applied to the State of California for

the analysis, as presented, applies only to non-current cases, we feel that the recommendation for additional analyses to cover plume interactions is justified.

The proximity of intake ports to discharge areas raises the possibility of recirculation. Figure 3-12 shows the beginning of the Unit 3 diffuser to be adjacent to the Unit 3 intake, 500 feet from the Unit 2 intake, and 1000 feet from the Unit 1 intake. If recirculation does occur, a discharge which is 20°F above "intake temperature" may not be the same as one that is 20°F above the "natural temperature" of the receiving water. The final statement should make clear the methods used to determine the "natural" temperature.

The applicants have considered a number of alternatives to the proposed cooling system including (1) a once-through single port discharge, (2) a once-through system with a lower change in temperature at the discharge, (3) saltwater cooling towers, and (4) both open- and closed-cycle systems.

We generally concur with the applicants' analyses of the systems and choice of the proposed system design. However, more detailed coverage of the costs and impact of closed-cycle natural draft tower operation might have been provided. Drift loss from mechanical draft towers is cited as 0.01 per cent (page 12-13). This value may be conservatively high by a factor of around 2, based on recent measurements in the 0.005 per cent range.

Biological Effects

The applicants have incorporated a velocity cap in the intake conduits for Units 2 and 3. Based on experience gained from the operation of Unit 1, which has a similar intake, it appears that this design

feature will significantly reduce potential entrainment and impingement losses at the station. Another important feature of the proposed cooling system design is the fish return system to be incorporated into the intake screenwell. While at the present time only estimates of effectiveness are available, 60 to 80 per cent fish return is cited as possible (p.5-12). EPA recommends that the applicants make reports on the progress of the ongoing research on this fish return system available to all interested parties.

The proposed biocide system, designed to eliminate slime-forming organisms within the condenser, involves chlorination 3 times daily for 15 minutes. Concentrations of residual chlorine of greater than 0.1 mg/l are projected at the point of discharge to the ocean. The AEC staff concluded that this concentration will not have a serious impact on the marine biota. However, EPA studies indicate that chlorination exerts a detrimental effect on marine organisms. We recommend that the applicants monitor impacts of the chlorination program and examine possible alternatives that would have less potential for adverse impact upon water quality.

The draft statement points out that the zooplankton mortality is almost 30 per cent in Unit 1, and the potential mortality in Units 2 and 3 is 100 per cent for many species (due to the longer entrainment time), yet it does not thoroughly trace the repercussions of this loss throughout the food chain. This potential effect is particularly important in view of the fact that many of the affected species are primary food sources. Similarly, the effects of phytoplankton losses are not thoroughly addressed; certain benthic organisms are planktonic during their life cycles, and these are not considered. The final statement should include studies which specifically address the questions of how

much biomass will be killed per day, which organisms will be killed, and the resulting effects throughout the system.

In general, the statement tends to measure thermal impact in terms of lethal and near-field exposure. It is not clear whether adequate consideration has been given to the more complex, subtle impacts resulting from lower thresholds of thermal exposure in the far-field. Such chronic, low-level changes in thermal conditions can be significant in terms of lasting effects on the marine environment, such as a reduction in species diversity.

ADDITIONAL COMMENTS

During the review we noted in certain instances that the draft statement did not present sufficient information to substantiate the conclusions presented. We recognize that much of this information is not of major importance in evaluating the environmental impact of the San Onofre Nuclear Generating Station, Units 2 and 3. The cumulative effects, however, could be significant. It would, therefore, be helpful in determining the impact of the plant if the following topics were addressed in the final statement.

1. A discussion of the alternatives for treatment of the condenser off-gases should be presented.

2. We note with interest the applicant's estimate of solid waste volumes which would result if blowdown liquids were processed through the miscellaneous waste system evaporator. Since the potential for treatment of secondary system leakage would add to this already significant estimate, the final statement should indicate the radioactivity levels at which treatment of blowdown and secondary system leakage would be initiated, and the degree of treatment required.

3. Besides presenting the estimates of aerated liquid wastes as "the equivalent volume (in terms of radioactivity) of primary coolant," it is suggested that the actual volumes of liquid processed and their major radioactive contaminants be stated.

4. The evaluation of dose assessment from natural terrestrial radiation (page 5-60) should be corrected to eliminate a double counting of the dose contribution from internal radiation.

5. In the summary of population exposures, it is suggested that the thyroid inhalation contribution be included.

6. The final statement should be expanded to include a discussion of the minor effects on existing air quality due to operation of the auxiliary boilers. The information required should include type of fuel (sulfur content, BTU rating and fuel use rate, as applicable), number of operating hours per year, and estimated emissions of air pollutants.

7. A statement regarding particulate control for the on-site concrete plant should be included.

8. In the discussion on leakage from the closed-loop system, it is indicated that drain water from bearing lubrication (from 25 to 125 gpm) will be discharged to the circulating water. The final statement should discuss the composition of this bearing lubrication and design alternatives that could prevent the discharge of lubricants to the ocean (e.g. sumps or holding basins).

9. Although the San Onofre Environmental Report indicated that there were no detectable corrosion products from heat transfer equipment made from copper nickel alloys in Unit 1, the draft statement goes into considerable depth pointing out copper as a possible pollutant. We concur with the AEC recommendation to monitor marine biota for copper and nickel accumulations near the power plant discharges.

10. The septic tank system will contain a sludge that must be disposed of. However, no mention is made of the disposal procedure. The final statement should contain a discussion of the proposed disposal method.